Human-Centered Computing at Mission Control

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Ames researchers are studying how mission operations (ops) are conducted at Johnson Space Center Mission Control with the goal of improving the information technology support, practices, and facilities in which mission operations are conducted. This work has led to the development of "ops assistants," tools specifically designed to support the work of flight controllers in Mission Control (figure 1).

The first ops assistant that has been developed is a tool to support the logging and handover practices of flight controllers. During a shift, flight controllers "log," or record, all events of interest. At the end of the shift, the flight controller "hands over" to a new flight controller. The handover process involves the new flight controller getting up-to-date on any configuration changes, any open problems or issues, and any significant activities that occurred since he or she was last on the shift.

The logging/handover tool supports the logging and handover process by providing an interface for logging events of interest; it stores these events in a database, tracks open issues, and enables users to

Fig. 1. Mission Control.

construct narratives about the status of issues. One of the key benefits of storing logs and handover records in a database is enabling the search for similar problems across shifts, missions, and generations of flight controllers.

The first two applications for the logging/handover tool are supporting the work of the capsule communicator (CAPCOM) (the astronaut in Mission Control who is responsible for all conversations with the astronauts in the spacecraft) in both the Shuttle Mission Control Center and the International Space Station (ISS) Mission Control Center, and the Station Duty Officer in the ISS Mission Control Center.

In FY99, Ames researchers conducted ethnographical observations of CAPCOM and Station Duty Officer work practices in Mission Control, and conducted participatory design sessions. The next phase will be in situ evaluations of the logging/handover tool in use by CAPCOMs and Station Duty Officers in Mission Control.

In addition, this project is investigating how Mission Control's operations will need to change for Mars operations because it takes 20 minutes for communication signals to travel between Earth and Mars. Mission Control's operation has traditionally been set up for interactive real-time communications. In FY99, the first step in analyzing how Mission Control could operate for a Mars operation was taken by setting up a "Mission Control" operation for the Haughton Expedition. The Haughton Expedition is an annual Mars analog study conducted on Devon Island in the Arctic Circle. Fieldwork conducted both at Devon Island and Mission Control is helping to define the requirements for information and information technology support for future Mission Control operations.
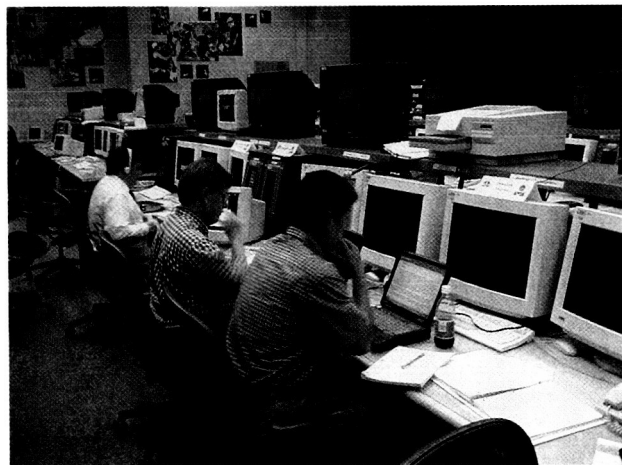
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